IJSSPT

"Back in Action" – a streamlined patient-centered approach to teach and practice movement strategies for patients with low back pain

Brittany Forster, PT, DPT
Mark Bishop, PT, PhD
Kim Dunleavy, PhD, PT, OCS
Department of Physical Therapy, University of Florida, Gainesville, Florida, 32610

Correspondence:
bforster0804@gmail.com

Background: Patients with low back pain often need to adjust movement strategies and require feedback on their performance. The implementation of a systematic but individualized approach was designed to provide a streamlined approach for therapists to identify appropriate targets for patients with low back pain.
Purpose: To present an efficient method (Back-in-Action) to teach and practice movement strategies for patients with low back pain. Design: Administrative Two Patient Case Study. Methods: The top three most limiting activities reported on the Modified Oswestry Disability Index were selected to develop an individualized exercise training circuit and a movement education home exercise program for two patients with chronic back pain (Patient A: female, age 54 and Patient B: female, age 64). Pain education materials were provided to each patient. A modified Functional Independent Measure scoring system provided standardization of feedback as a reflection of each patient progress. Results: After a two month trial program, therapists reported moderate to strong patient compliance and were highly satisfied with patient performance. By discharge, both patients decreased in disability levels according to MODI scores (Patient A: Pre: 46%, Post: 10%; Patient B: Pre: 62%, Post: 31%). Conclusions: The "Back in Action" program incorporates patient-centered individualized activity circuit training by prioritizing responses from outcome measures and records standardized measures of the extent of feedback along with functional outcome measures as a reflection of improvement. The system is efficient, tailored to individual needs, and allows patients to practice movement strategies with feedback. Further investigation of the reliability of the feedback scoring system and overall outcomes is warranted.
Key Words: *LBP, patient education, outcome measures*

Introduction

Low back pain is one of the most common symptoms experienced throughout the world and is a major cause of activity limitation and work participation.[1] Management has been shown to help prevent the transition of acute pain to chronic symptoms as well as help impact those patients already in the chronic phase.[2] Physical therapists employ multiple different intervention strategies including lumbar and lower extremity stretching and progressive strengthening exercise, manual therapy (manipulation, nerve and soft tissue mobilization) and movement re-education.[2] The education component is often separate from the other avenues of treatment and may decrease in frequency as the patient progresses within the treatment plan[3]; moreover, education is typically not individualized to the needs of the patient symptoms.[3] As the symptoms of low back pain can vary widely based on the personal and environmental requirements for activities of daily living, a method to integrate education related to movement and pain management is indicated.

The symptoms of the individual patient should be managed with skilled training and education in a systematic manner. Currently, back care education formats vary considerably. Self-care books, small group discussions with video presentation, brief education (single session), and back schools (multiple sessions) offer fair evidence[4] for being as beneficial in reducing symptoms as compared to usual care, with the most limiting factor being limited evidence for long term effects of these teaching methods. Some of these formats may also be limited by time and insurance reimbursement, and not all clinics are able to offer services of extended sessions of intensive education such as for a back school. There is therefore a need for an efficient method to provide personalized education using the available resources in the clinic.

When determining the efficacy of movement education in the clinic, there is conflicting evidence and recommendations. For example, some studies suggest that training patients with acute LBP to adjust their movement strategies (body mechanics) may not be justified for symptom reduction and prevention[6] given the self-limiting nature of the condition.[1] There is strong evidence, however, that back pain education and movement training for patients with chronic low back pain (symptoms lasting > 6 months) is as effective as usual care to reduce pain, and is more effective than usual care for patients returning to work.[6]

Burton et al[7] has advocated for integration of biopsychosocial principles with a biomechanical model, as there is not sufficient evidence for the two to stand alone in prevention of low back pain. In terms of treatment for chronic conditions, education on pain neurophysiology, pain behaviors, and methods to understand the need to continue to move has been shown to significantly improve disability, catastrophization and physical performance.[8] While the complexities of pain behavior make it difficult to isolate the effect of movement education, workplace adaptations and movement education are often used in return to work and prevention programs.[5, 7] It is crucial the patient becomes involved in their own care and understands the importance of the back care in daily activities so that long-term success can be maintained. Research does state that workplace ergonomic adaptions could allow for faster return to work, however, these programs would need "organizational dimensions" and high involvement of the patient.[7] These same principles could be applied to the general population when patients need to return to activities of daily living. It is reasonable to suggest that a combination of education about pain and movement reeducation provided in an organized, systematic approach might be a useful method to assist patients with returning to their daily activities.

Self-reported outcome measures such as the Oswestry Disability Index (ODI) are comprised of questions related to ability to perform daily activities and have frequently been utilized in studies with patients with low back pain. These measures reflect overall perceived disability and have been linked to the ICF model in measuring health status.[9] Modified versions such as the Modified Oswestry Disability Index (MODI) have also been reported as highly valid and reliable for measuring low back pain.[10]

Typically outcome measures are used to capture the health problems that are most important to patients. Dulmen et al[11] highlights how patient reported outcome measures aid in setting goals and determining appropriate interventions. Findings show that when outcome measures are performed at baseline and follow up, these scores moderately match the goals outlined by the patient. While this study attempted to correlate outcome measures to ICF categories, it was determined that the use of too many measures may produce overlap in items making it difficult to assess the goals that are of highest priority.[11] This is supported by Clement et al[12] in their review of outcome measures related to lumbar degenerative disorders through numeric pain scales, ODI, the quality of life EQ-5D-3L questionnaire, and surveys of work status and analgesics. These findings emphasize the meaningful feedback received from outcome measures; however, there is recommendation to focus on utilizing outcome measure scores to maximize the "value of care" delivered to the patient.[12] Findings from Baradaran et al[10] report activities of "Standing," "Lifting," and "Walking" to have the highest pain averages respectively in patients with low back pain which emphasizes the importance of prioritizing functional activities specific to the patient.

The purpose of this administrative case study is to present a method using an outcome measure to determine the priorities for movement strategy intervention and chronic pain education and a novel application of the FIM to assess the amount of feedback the patient required to complete the task. The "Back in Action" program was implemented in an outpatient clinic to provide a customized but still efficient approach to treatment of two patients diagnosed with low back pain based from responses on the MODI outcome measure.

Methods

Patient Descriptions

Two patients were referred for physical therapy management for low back pain. Patient A is a 54 year-old female with complaints of general low back pain for over a year. Patient B is a 64 year-old female with complaints of general low back pain for many years along with a lumbar fusion 5 years ago. Neither patient had undergone body mechanic training or received chronic pain education in the past. Patients were evaluated and treated during different times of clinic operation. Institutional Review Board approval was not required by the University of Florida for an administrative method description and quality improvement study.

Program Overview

The "Back in Action" approach was implemented in a small outpatient clinic staffed by one Physical Therapist and two Physical Therapy Assistants. Typically each therapist treated two patients per hour depending on the patient's level of assistance. During a two-month trial period, a body mechanic back pain education program referred to as "Back in Action" was incorporated into the clinic in order to encourage a systematic and individualized approach when evaluating and treating two patients with low back pain. Patients A and B were evaluated to determine appropriateness for physical therapy services. During the evaluation, each patient completed the MODI and the top three most disabling activities of daily living were selected from the MODI and confirmed with the patient. The top three activities could include "Personal Care," "Lifting", "Walking", "Sitting", "Standing", "Sleeping", "Traveling", and "Employment/Homemaking". "Pain Intensity" and "Social Life" were not considered in the selection.

The MODI is common self-reported measure to help quantify the disability in patients undergoing a number of lumbar syndromes. The 10-item questionnaire takes less than 5 minutes to compete and asks the patient to rate level of severity (0-5; 0: least severe and 5: most severe) with pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and employment/homemaking.[17] Baradaran et al[10] found this outcome measure to have good test-retest reliability (ICC: 0.43 to 0.80 on individual question items) and to have a strong to moderate convergent validity when compared to SF-36 ($r= -0.54$, $p<0.001$). Results of 0-20% are considered Minimal Disability, 20-40% are Moderate Disability, 40-60% are Severe Disability, 60-80% are Crippled or Housebound, and 80-100% are Bed Bound or Exaggerating[13].

With the determination of the top three activities that were most difficult at evaluation, the therapist would provide each patient with an appropriate home exercise program packet (HEP) of specific body mechanic instructions that correlated to the top activities (see appendix 1). These packets could be adjusted to fit the activities most relevant for the patient's daily routine. Activities for efficient movement strategies that correlated with the home program were then implemented in supplement treatment sessions. In order for the patient to practice body mechanics during the treatment sessions, a customized exercise circuit was established. During the treatment session, the therapist would explain the movement, why it is important in back care, and provide feedback as necessary. A timer would be set, and each patient would practice one task for the allotted time before moving onto the next task. The use of a circuit was chosen so that the patient could rotate through three to four movements without disrupting clinic procedures and provide a more efficient flow within the clinic. The therapist would also review the home exercise packet that would be specific to activities most performed by the patient throughout the day. For example, the last category combines Employment and Homemaking; however, if the patient was not working, the patient's individualized home exercise packet would be adjusted to only include proper body mechanics for activities around the house.

In order to track the level of cueing required by the therapist during therapy sessions, components of the Functional Independence Measure (FIM) were incorporated. The FIM is typically used in neurological settings to describe the level of assistance required when performing certain activities of daily living and is based off of the ICF model.[14] While this measure is not typically used in the outpatient orthopedic setting, similar scoring and describing the level of assistance that was used in the "Back in Action" program served as a quick reference to document the extent of cueing required. Typically the FIM uses percentages of 100% (Total Assistance), 75% (Maximum Assistance), 50% (Moderate Assistance), and 25% (Minimal Assistance) and then there is Standby Assistance and Independence. For consistency in documentation in the clinic, the "Back in Action" program labeled Standby Assistance at 10% assistance and Independence as 0% assistance (see Table 1). Table 2 illustrates an example of movements and tasks performed in the circuit along with use of FIM for Patient A and B.

By breaking down the activities into discrete tasks (i.e. squat taps prior to continuous lifting) and having the patient work through a circuit of activities while being provided with a variety of tactical, verbal, and observational feedback (i.e. scoring from FIM), the patient was able to practice specific movement strategies and transition through the different stages of motor learning depending on the level of feedback provided.[15] The tactic of breaking down large movements into smaller components or less degrees of freedom through graded exposure has been shown to also help decrease pain catastrophization.[2] The therapist would use the FIM to document the assessment of the percentage of feedback required of the patient in order to perform the task correctly.

In addition to body mechanics training, a handout was developed by the author about chronic pain was also distributed to both patients to serve the

purpose of education on either a current chronic condition or acute symptom prevention (see appendix 2) highlighting points outlined by Louw;[16] for example, an explanation of central sensitization through an analogy of the nervous system being a system of roads with certain pathways of normal activity being blocked while all signals of normal movement are now presented as signals of pain. Evidence from Lundy-Ekman, L[17] and Xu, et al[18] was incorporated in the document to help explain the neurophysiology of pain and transition from acute to chronic pain. The handout was distributed on the follow up visit after the initial evaluation, so the therapist could review the material with the patient and answered any questions concerning their symptoms. Body mechanic training and pain education was performed in conjunction with other treatments and exercises that patients typically receive for low back pain management.

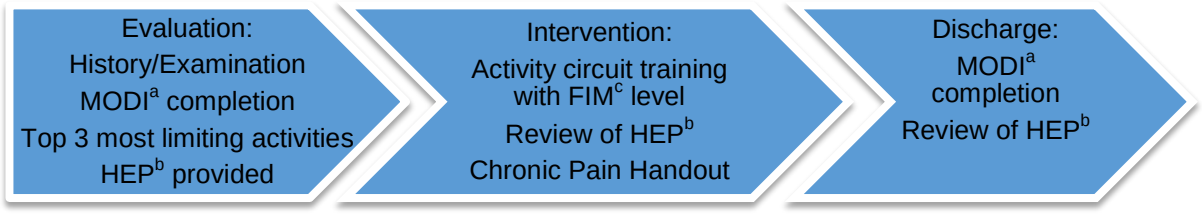
The MODI was again assessed prior to discharge in order determine effectiveness of therapy intervention (see Figure 1). Therapists were encouraged to utilize CPT codes of Therapeutic Activity and Self Care (the highest reimbursement codes) to justify time spent educating patient during each therapy session during incorporation of the "Back in Action" program.

Table 1. Description of Level of Assistance.

100 %	Total Assistance: 100% assistance physical or cognitive
75%	Maximal Assistance: 75% assistance physical or cognitive assistance
50%	Moderate Assistance: 50% assistance physical or cognitive assistance
25%	Minimal Assistance: 25% physical or cognitive assistance
10%	Standby Assistance: need for supervision by one personal to perform new activity. Only verbal instruction
0%	No physical or cognitive assistance, cueing or supervision required. Performs timely and safely. No limitation

[a.] Adapted from the Functional Independence Measure

Figure 1. "Back in Action" Flow Diagram



[a.] MODI: Modified Oswestry Disability Index, [b.] HEP: Home Exercise Program, [c.] FIM: Functional Independence Measure

Table 2. Example of "Back in Action" Circuit Training

Patient A	MODI[a] category	Movement/ Activity[b]	Description	FIM[c]
	Lifting	1. Squat Taps	2 minutes: initiate proper lifting technique by with	10% verbal cues for increase base of

			only taping the top of box (no lifting yet)	support
	Standing	2. Rows with TA Activation	2 minutes: standing theraband row progression	25%: tactile cues to move scapula down and back and keep head in neutral position
	Employment/ Homemaking	3. Half-kneel stability	2 minutes: chop/lift with objects from floor to table	25% tactile cues to reduce excessive twisting through spine
Patient B	MODI category	Movement/ Activity	Description	FIM
	Walking	1. Walking around clinic carrying object	2 minutes: carrying weighted object	10% verbal cues for posture and TA activation
	Employment/ Homemaking	2. Hip Hinges	2 minutes initiate sit <> stand through hip flexion	25%: tactile cues at hip flexors for further posterior weight shift
	Personal Care	3. Log Roll	2 minutes: supine <> sit edge of bed	25%: tactile cues for upper extremities to help push self up

[a.] MODI – Modified Oswestry Disability Index
[b.] Each exercise performed three times in a circuit as the following: 1, 2, 3, 1, 2, 3, 1, 2, and 3 (rest as needed).
[c.] FIM – Functional Independence Measure
[d.] <> – Repeating activity

Program Evaluation

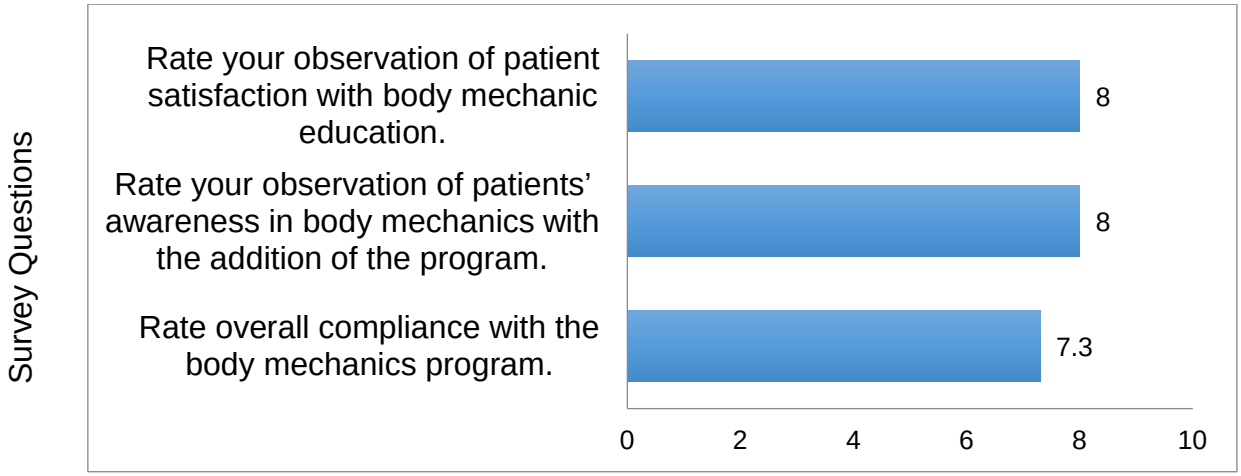
Therapists provided feedback on the "Back in Action" method after a two-month trial period. The therapists were asked to rate his or her opinion on a 0 to 10 scale related to observed patient satisfaction with program demonstration and materials, patients' movement awareness in response to the program, and to rate themselves, as therapists, in overall compliance with the body mechanic program in the clinic. It was predetermined that any responses less than a 7/10 would need further adjustment.

Results

During the two-month trial period, Patient A received 9 sessions of physical therapy. The top most limiting activities according to the MODI at the evaluation were: Lifting, Standing, and Employment/Homemaking. Her MODI disability category changed from a Severe Disability to Minimal Disability (Pre: 46%, Post: 10%). Patient B received 10 sessions of physical therapy. The top most limiting activities according to the MODI at the evaluation were: Walking, Employment/Homemaking, and Personal Care. Her MODI disability category changed from Severe Disability to Moderate Disability (Pre: 62%, Post: 31%). Patients A and B both completed at least one activity from the exercise circuit during each therapy session in conjunction with standard low back pain physical therapy management.

Therapists reported moderate ratings of overall satisfaction in the "Back in Action" program, represented Figure 2. Specifically, survey responses indicated 8/10 for PT rating of observed patient satisfaction with the program, 8/10 for PT rating of patient awareness in body mechanics, and 7.3/10 in rating themselves, as therapists, in overall compliance of the body mechanics program. Compliance with the program consisted of the therapist maintaining the systematic routine outlined in the "Back in Action" program (i.e. picking the top three most disabling activities, providing the recommended home exercise program packet and chronic pain handout, and incorporating the body mechanic circuit training during every session). From the open comment section of the survey, the most concern about the program was that the number of home exercises provided to the patient could potentially be overwhelming to the patient; therefore, the number of exercises in the packet may need to be reduced.

Figure 2. Therapists Survey Responses (N=3)



In terms of billing during these two months, the CPT codes used the most overall throughout patient treatment were Therapeutic Exercise, followed by Therapeutic Activity. The Self Care CPT code was not utilized for these two patients. Units were based on the 8-minute rule; therefore, it was common for the therapists to bill 25 minutes for 2 units of Therapeutic Activity and 30 minutes for 2 units of Therapeutic Exercise for a total 55-minute therapy session. During initial treatments, patients would receive one on one body mechanic training since feedback was crucial at this point in understanding correct movement strategies. As the patient progressed through therapy, therapists were able to supervise the circuit training while treatment of other patients with other diagnoses occurred. Moreover as the patient progressed, a trend was noted in a shift to billing 15 minutes for 1 unit of Therapeutic Activity and 40 minutes for 3 units of Therapeutic Exercise as patients became more independent with knowledge base and movement patterns.

Discussion

The aim of this administrative case study was to describe the use of an outcome measure in order to drive choices and priorities for a back care movement education circuit and a novel application of the FIM to assess the amount of feedback the patient required to complete the task. The "Back in Action" program can be implemented in a systematic way that will allow for individualized customization and education on movement for patients with low back pain. Following the two-month trial period, the program was rated highly by therapists both in terms of observed patient satisfaction and demonstration of proper body mechanics. This was supported with the MODI scores of patients A and B through demonstration of a decrease in disability level by discharge.

Similar comprehensive models have shown positive results. Shirado et al[19] displayed similar findings with development of a multidisciplinary team approach when treating patients with chronic low back pain through use lectures on anatomy and mechanism of low back pain, a functional evaluation, guidance with therapeutic exercise and body mechanics, and psychological assessment. Significant findings were established with increased trunk motion, strength, and endurance, as well as a significant reduction in MODI scores and overall high compliance and satisfaction.[19] Other tools are being used in the primary care settings to screen patients on severity of low back pain. Murphy et al[20] reported significant improvements using the "STarT Back" model to allow early detection of psychologically distressed patients. The model uses a simple questionnaire to determine if a patient is high, medium, or low risk. From there, a decision is made to triage time on how to effectively educate patients on treating symptoms based on individual risk. Work by Fritz and Beneciuk et al[21] indicates that the StarTBack tool is appropriate for use by physical therapists in outpatient settings. While this tool was not used in this case study, it could serve as an effective adjunct measure for physical therapists when deciding how much time should be spent in education and reducing severity levels of patients. The overall objective of these

models is to develop individualized, personal care to fit the needs of the patients while tracking progress objectively for an overall systematic approach when treating a highly variably condition such as low back pain. This reasoning aligns with the objectives of the "Back in Action" program.

The retrospective descriptive administrative case study and limited time frame (two months) does not allow commentary on the longer-term effects of the "Back in Action" program. This case study was used in a small clinic with treatment provided by one physical therapist and two physical therapy assistants. Therefore, similar outcomes may not translate to larger staffed and higher patient population clinics. Moreover, outcomes from this case study cannot be directly correlated with the "Back in Action" implementation due to possible self limiting factors, other treatments implemented during the course of physical therapy, and no established control group.

As with any new program, the implementation was not without some difficulties. The shift in use of codes was slow. Some individual treatment sessions included time for pain modalities such as ice or hot packs; however, traditionally this time is not typically billable. It was recommended the therapist use this time to bill as Self Care to educate the patient on safety of proper body mechanics during specific activities of daily living. Future studies should consider assessing the change in productivity if higher reimbursed Therapeutic Activity and Self Care units are billed since these may not be utilized to the full potential under usual care for patients with low back pain.

The implementation of the methods required training time for therapists in utilizing the FIM for providing feedback. Prior to implementation of the "Back in Action" program, 2 one-hour training sessions were provided in practicing the program flow and use of the FIM. Since the FIM was adapted as a novel approach in providing feedback for this patient population, future studies should assess the reliability and validity of this modified scale as an instrument in this setting and for patients with low back pain. The current FIM scoring includes a baseline for patients who are completely dependent; however, this is typically not characteristic of the patient population in the outpatient setting. Therefore, the tool will need to be adjusted for application to higher-level patients when providing feedback. Furthermore, the use of video analysis should be considered to provide additional feedback for the patient when performing activities.

Conclusions:

The "Back in Action" program incorporates both the biomechanical model with the activity circuit as well as the biopsychological model with chronic pain education. The prioritized activities and explanation of pain science relates to the ICF model[9] by focusing on specific activity limitations while encompassing a holistic approach of the patient's environment, personal factors, and areas of participation. The approach is suggested to be worthy of further study and may be useful for clinicians in small clinics. The results of this study can be used for future research in prioritizing responses from outcome measures, performing circuit training as an avenue in patient motor learning, standardization in the extent of feedback as a reflection of improvement, and the inclusion of pain education along with movement education. The customized movement reeducation allows the therapist to provide relevant activity practice and improve the patient's confidence to improve overall quality of life.

Clinical Relevance

The program described in this paper is likely to be useful to readers who are seeking options to provide efficient but thorough methods to manage one of the top disabilities contributing a major burden to the health care system. The paper also provides justification for use of outcome measures to drive exercise prioritization, and suggests options for methods to meet patient satisfaction, and financial reimbursement.

ACKNOWLEDGEMENTS

Special thanks to Dr. Stephanie Crandall at Brooks Rehabilitation and the patients who participated.

REFERENCES

[1] Refshauge and Maher. Low back pain investigations and prognosis: a review. *Br J Sports Med* 2006;40:494–498, doi: 10.1136/bjsm.2004.016659

[2] Delitto et al. Low Back Pain Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association. *J Orthop Sports Phys Ther.* 2012;42(4):A1-A57. doi:10.2519/jospt.2012.0301

[3] Kerssens JJ, Sluijs EM, Verhaak PFM, et al. Back care instructions in physical therapy: a trend analysis of individualized back care programs. *Phys Ther.* 1999;79:286–295.

[4] Chou and Huffman. Guideline for the Evaluation and Management of Low Back Pain Evidence Review. *American Pain Society*. 2009:124-126, 338.

[5] Heymans et al. Back Schools for Nonspecific Low Back Pain. SPINE. 2005; Volume 30, Number 19:2153–2163

[6] Brox et al. Evidence-informed management of chronic low back pain with back schools, brief education, and fear-avoidance training. *The Spine Journal* 8 (2008) 28–39

[7] Burton. How to prevent low back pain. *Best Practice & Research Clinical Rheumatology*. 2005; Vol. 19, No. 4:541–555 doi:10.1016/j.berh.2005.03.001

[8] Louw et al. The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain. Arch Phys Med Rehabilitation; 2011; Vol 92:2041-2056,doi:10.1016/j.apmr.2011.07.198

[9] Stier-Jarmer et al. How to Apply the ICF and ICF Core Sets for Low Back Pain. *Clin J Pain*. 2009; Volume 25, Number 1:29-38

[10] Baradaran et al. Cross-Cultural Adaptation, Validation, and Reliability Testing of the Modified Oswestry Disability Questionnaire in Persian Population with Low Back Pain. AsianSpineJ. 2016;10(2):215-219

[11] Dulmen SA, et al. Patient reported outcome measures (PROMs) for goalsetting and outcome measurement in primary care physiotherapy, an explorative field study. Physiotherapy (2016) http://dx.doi.org/10.1016/j.physio.2016.01.001 http://dx.doi.org/10.1016/j.physio.2016.01.001

[12] Clement et al. A proposed set of metrics for standardized outcome reporting in the management of low back pain. Acta Orthopaedica 2015; 86 (5): 523–533 DOI 10.3109/17453674.2015.1036696

[13] Fritz JM, Irrgang JJ. A comparison of a modified Oswestry Low Back Pain Disability Questionnaire and the Quebec Back Pain Disability Scale. *Physical Therapy*. 2001;81:776-788 DOI: 10.2522/ptj.2001.81.2.776

[14] Raad. FIM instrument (FIM) trademark of the Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc. Rehab Measures. 2015.

[15] Kisner, C., & Colby, L. A. (2012). *Therapeutic Exercise: Foundations and Techniques (6th ed.)*. FA Davis Company. Pg 28-30.

[16] Louw, A. Why do I hurt? Neuroscience Education for Patients in Pain. International Spine and Pain Institute (2013); 1-11

[17] Lundy-Ekman, L. Neuroscience Fundamentals for Rehabilitation. Fourth Edition. Elsevier Saunders (2013); 143-150.

[18] Xu et al, Enhanced expression of neuronal proteins in idiopathic frozen shoulder. J Shoulder Elbow Surg (2012) 21, 1391-1397, DOI: 10.1016/j.jse.2011.08.046

[19] Shirado et al. A Novel Back School Using a Multidisciplinary Team Approach Featuring Quantitative Functional Evaluation and Therapeutic Exercises for Patients With Chronic Low Back Pain. SPINE. 2005,Volume 30, Number 10;1219 –1225

[20] Murphy et al. Comparison of a Stratified Group Intervention (StarT Back) with Usual Group Care in Patients with Low Back Pain: A Nonrandomized Controlled Trial. *SPINE*. 2016, Volume 41, Number 8; 645–652, DOI: 10.1097/BRS.0000000000001305

[21] Beneciuk and Fritz et al. The STarT Back Screening Tool for prediction of 6 month clinical outcomes: relevance of change patterns in outpatient physical therapy settings. J Orthop Sports Phys Ther. 2014 Sep;44(9):656-64

Appendix 1: Sample of Activities provided in Home Exercise Program Packets

MODI Category	Activity	Description
Personal Care (B)	Shaving	Place one hand on the counter while keeping feet in a forward lunge position. Keep back straight and place a well-cushioned mat in front of the sink.
	Brushing Teeth	Open cabinet door under sink and place one foot on edge of bottom shelf. Place one hand on counter for support and a well-cushioned mat in front of sink.
Lifting (A)	Proper Lifting Technique	Stand with wide base of support close to object. Bring hips back as if sitting in chair while keeping back straight. Grasp object and hold close to body. Contract abdominal muscles and come to standing by pushing through legs.
	Lifting/ Movement of Load	Keep object close to body. Move feet first in direction you are moving object. Avoid twisting of the spine.
Walking (B)	Transverse abdominus activation	Stand tall with shoulder blades down and back. Draw in abdomen towards spine to activate transverse abdominus. Avoid holding breath.
	Posture	Keep back straight with shoulders and neck relaxed. Wear supportive shoes. Distribute weight evenly between feet and allow natural arm swing.
Sitting	Education on stand to sit	Bend at hips while keeping back straight when shifting weight into seat.
	Posture	Sit tall with low back slightly arched and shoulders back and down. Rest feet on floor, allow elbows to rest comfortably on armrests.
Standing (A)	Education on sit to stand	Scoot forward towards edge of seat. Place feet shoulder width apart. Keep back straight as you lean forward over knees. Stand tall as you push through legs.
	Posture, prolonged standing	Stand tall with shoulders down and back. Activate transverse abdominus. For long periods, place one foot an elevated objects and switch sides throughout activity. Wear supportive shoes.
Sleeping	Log roll/ supine to sit	Bend both knees, roll onto side, and drop legs off the edge of bed while using arms to help push self into sitting. This helps reduce stress to spine.

	Postures/ pillow placement	Supine- place a pillow under knees; Side lying- place a pillow between knees and under top arm; Prone- place pillow under abdomen
Traveling	Car transfer	Enter: position self with back of legs against side of seat. Keep back straight while lowering to seat. Turn whole body into car without twisting through spine. Exit: turn whole body so you are facing outside the car with both feet on the ground. Use car seat to help push up to standing.
	Posture	Use a lumbar cushion while seated in car to maintain good posture.
Employment/ Homemaking (A, B)	Vacuuming/ sweeping	Make sure legs are doing the work and not your back. Transfer weight more efficiently by placing feet in a lunge position. Change directions by moving feet first to avoid twisting through the spine. Take breaks.
	Dishwasher	Keep back straight throughout task. Place a hand on the counter for support and perform lifting through legs, not your back. Break task up, by placing dishes on counter before placing on high shelf.
	Lifting heavy object (Laundry)	Stand with wide base of support close to object. Bring hips back as if sitting in chair while keeping back straight. Grasp object and hold close to body. Contract abdominal muscles and come to standing by pushing through legs.
	Raking/shoveling	Make sure legs are doing the work and not your back. Transfer weight more efficiently by placing feet in a lunge position. Change directions by moving feet first to avoid twisting through the spine. Take breaks.
	Desk ergonomics	Shoulders should be relaxed. Arms close to trunk with elbow close to 90 degrees. Forearms resting on workstation with wrists in neutral position. Thighs parallel to floor with feet rested on floor. Eye-screen distances should be at least 19 inches. Keep head up and eyes looking forward.

*A: Patient A received handouts on these selected activities
*B: Patient B received handouts on these selected activities

Appendix 2: Chronic Pain Handout

What is driving my chronic pain?

Pain is classified as chronic if symptoms continue or become increasingly worse for greater than 6 months.

"Is this pain all in my head?"

Our brains perceive pain from the signals our nerves send. ***There are over 400 nerves in our body[1]*** and they are all sending signals to our brain about how we are reacting to our surrounding environment. There are nerves that send signals of touch, vibration, pressure, how our joints are positioned, and **pain**[2].

When an injury occurs and there is not enough healing time or if we repeatedly aggravate the area, ***the brain receives a constant flow of pain signals.*** Typically when we have an injury, our nerves send signals to our brain about the harmful stimulus. If this signal is strong enough, it will tell our brain that we have hit a maximum threshold. This causes alarms to sound through our body that we are experiencing pain[1]. It is our body's natural way to protect us from danger, so we can react to prevent further injury. With chronic pain however, the threshold is much lower, so much so, that simple activities we used to do throughout the day such as getting dressed, bathing, walking, and sleeping become intolerable[2]. ***Our pain nerves are in a hypersensitive state[1]!*** Other factors take place adding to our heightened sensitivity: fear, anxiety, failed treatments, stress, temperature, and illness[2].

Our nervous system actually changes!

Signals that send information to our brain of what our body is doing [such as bending over to pick up an object or lying in our bed to sleep] are now being interfered with the nerves that amplify pain. ***Our alarm system is constantly being activated!***

Think of our different types of nerves as a system of roads though our body. From the changes in our nervous system, detour signs are blocking the road of signals for normal muscle activity and comfort with sleeping. Now all the traffic signals are flowing down the road of pain.

Recent studies have found evidence that with certain chronic pain conditions, new pain nerves are made and increasing sensitivity of the area[3]. Now the pain road has widened its lanes and has become a maze of interstate highways.

Chronic pain can be managed!

But you have to take the wheel to drive towards recovery! You will learn how to gradually ***retrain your muscles to increase your body's awareness to distinguish from what is a normal movement and what is causing actual harm.*** By keeping a positive attitude and working with your therapist and other pain management specialists, you will learn how to modify your activities throughout the day so that you are able to work at a tolerable level. Your body will take time to readjust to the normal route, but continue to keep a clear view.

Its time to take back the driver's seat!

1. Lundy-Ekman, L. Neuroscience Fundamentals for Rehabilitation. Fourth Edition. Elsevier Saunders (2013); 143-150.
2. Louw, A. Why do I hurt? Neuroscience Education for Patients in Pain. International Spine and Pain Institute (2013); 1-11
3. Xu et al, Enhanced expression of neuronal proteins in idiopathic frozen shoulder. J Shoulder Elbow Surg (2012) 21, 1391-1397